

MISSOURI ALIGNMENT FOR NIH SUPPLEMENT HUMAN GENETIC VARIATION

HUMAN GENETIC VARIATION		
Missouri Grade Level Expectations: Science – Grades 9 – 11		
Activity	Standard	GLE
3	3.1.B.b	Identify factors (e.g., biochemical, temperature) that may affect the differentiation of cells and the development of an organism.
2	3.1.C.a	Recognize all organisms are composed of cells, the fundamental units of structure and function.
2	3.2.E.a	Explain how the DNA code determines the sequence of amino acids necessary for protein synthesis.
2, 3, 4	3.2.G	Life processes can be disrupted by disease (intrinsic failures of the organ systems or by infection due to other organisms).
2	3.3.B.a	Describe the chemical and structural properties of DNA.
1, 2, 3	3.3.B.b	Recognize that DNA codes for proteins, which are expressed as the heritable characteristics of an organism.
2, 3	3.3.B.d	Explain how an error in the DNA molecule (mutation) can be transferred during replication.
1, 2	3.3.B.e	Identify possible external causes (e.g., heat, radiation, certain chemicals) and effects of DNA mutations (e.g., protein defects which affect chemical reactions, structural deformities).
1, 2	3.3.D.b	Describe how genes can be altered and combined to create genetic variation within a species (e.g., mutation, recombination of genes).
1, 2	3.3.D.c	Recognize that new heritable characteristics can only result from new combinations of existing genes or from mutations of genes in an organism's sex cells.
1, 2, 3	4.3.C.a	Describe how variation in characteristics provides populations an advantage for survival.
2, 3	4.3.C.b	Identify examples of adaptations that may have resulted from variations favored by natural selection.
2, 3	4.3.C.d	Explain how environmental factors (e.g., habitat loss, climate change, pollution, introduction of non-native species) can be agents of natural selection.
2, 3	7.1.A.a	Formulate testable questions and hypotheses.
2, 3	7.1.A.b	Analyzing an experiment, identify the components (i.e., independent variable, dependent variables, control of constants, multiple trials) and explain their importance to the design of a valid experiment.
3	7.1.A.c	Design and conduct a valid experiment.
2, 3	7.1.A.d	Recognize it is not always possible, for practical or ethical reasons, to control some conditions (e.g., when sampling or testing humans, when observing animal behaviors in nature).
2, 3	7.1.A.e	Acknowledge some scientific explanations (e.g., explanations of astronomical or meteorological phenomena) cannot be tested using the standard experimental "scientific method" due to the limits of the laboratory environment, resources, and/or technologies.
2, 3	7.1.A.f	Acknowledge there is no fixed procedure called "the scientific method", but that some investigations involve systematic observations, carefully collected and relevant evidence, logical reasoning, and some imagination in

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		developing hypotheses and other explanations.
3	7.1.A.g	Evaluate the design of an experiment and make suggestions for reasonable improvements.
2, 3	7.1.B.a	Make qualitative and quantitative observations using the appropriate senses, tools and equipment to gather data (e.g., microscopes, thermometers, analog and digital meters, computers, spring scales, balances, metric rulers, graduated cylinders).
2, 3	7.1.B.c	Determine the appropriate tools and techniques to collect, analyze, and interpret data.
2	7.1.B.d	Judge whether measurements and computation of quantities are reasonable.
2, 3	7.1.C.a	Use quantitative and qualitative data as support for reasonable explanations (conclusions).
2, 3	7.1.C.b	Analyze experimental data to determine patterns, relationship, perspectives, and credibility of explanations (e.g., predict/extrapolate data, explain the relationship between the independent and dependent variable).
2, 3	7.1.C.c	Identify the possible effects of errors in observations, measurements, and calculations, on the validity and reliability of data and resultant explanations (conclusions).
2, 3, 4	7.1.D.a	Analyze whether evidence (data) and scientific principles support proposed explanations (hypotheses, laws, theories).
2, 3, 4	7.1.D.b	Evaluate the reasonableness of an explanation (conclusion).
2, 3	7.1.E.a	Communicate the procedures and results of investigations and explanations through: oral presentations; drawings and maps; data tables (allowing for the recording and analysis of data relevant to the experiment such as independent and dependent variables, multiple trials, beginning and ending times or temperatures, derived quantities); graphs (bar, single, and multiple line); equations and writings.
2, 3, 4	7.1.E.b	Communicate and defend a scientific argument.
2, 3	7.1.E.c	Explain the importance of the public presentation of scientific work and supporting evidence to the scientific community (e.g., work and evidence must be critiqued, reviewed, and validated by peers; needed for subsequent investigations by peers; results can influence the decisions regarding future scientific work).
2, 3, 5	8.1.B.a	Recognize the relationships linking technology and science (e.g., how technological problems may create a demand for new science knowledge, how new technologies make it possible for scientists to extend research and advance science).
2, 3, 5	8.2.B.a	Identify and describe how explanations (hypotheses, laws, theories) of scientific phenomena have changed over time as a result of new evidence (e.g., model of the solar system, basic structure of matter, structure of an atom, Theory of Plate Tectonics, Big Bang and nebular theory of the Universe, explanation of electric current).
2, 3, 5	8.3.B.a	Analyze the roles of science and society as they interact to determine the direction of scientific and technological progress (e.g., prioritization of and funding for new scientific research and technological development is determined on the basis of individual, political and social values and needs; understanding basic concepts and principles of science and technology influences debate about the economics, policies, politics, and ethics of various scientific and technological challenges).
2, 5	8.3.B.b	Identify and describe major scientific and technological challenges to society and their ramifications for public policy (e.g., global warming, limitations to fossil fuels, genetic engineering of plants, space and/or medical research).

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2, 5	8.3.B.c	Analyze and evaluate the social, political, economic, ethical, and environmental factors affecting progress toward meeting major scientific and technological challenges (e.g., limitations placed on stem-cell research or genetic engineering, introduction of alien species, deforestation, bioterrorism, nuclear energy, genetic counseling, computer technology).
2, 3	8.3.C.b	Identify the ethical issues involved in experimentation (i.e., risks to organisms or environment).
4	8.3.C.c	Identify and evaluate the role of models as an ethical alternative to direct experimentation (e.g., using a model for a stream rather than pouring oil in an existing stream when studying the effects of oil pollution).

Missouri Grade Level Expectations: Mathematics – Grades 9 & 10

Activity	Standard	GLE
1, 2, 3, 4	MA 1 3.4	Use real numbers to solve problems.
2, 3, 4	MA 5 3.6	Use a variety of representations to demonstrate an understanding of very large and very small numbers.
2	MA 4 1.6,1.10	Apply properties of exponents (including order of operations) to simplify expressions.
1, 2, 3	MA 1,4,5 1.4,3.4	Apply operations to real numbers, using mental computation or paper-and-pencil calculations for simple cases and technology for more complicated cases.
1, 2, 3	MA 5 1.10,3.3	Apply all operations on real numbers
1, 2, 3	MA 1 3.8	Judge the reasonableness of numerical computations and their results.
1, 2, 3	MA 1,4 3.3	Solve problems involving proportions.
1, 2	MA 4 1.6	Compare and contrast various forms of representations of patterns.
1, 4	MA 2 3.1	Draw or use visual models to represent and solve problems.
1, 3	MA 3 1.2	Formulate questions, design studies and collect data about a characteristic.
1, 2, 3	MA 6 1.8, 3.6	Select, create and use appropriate graphical representation of data.
1	MA 3 1.6	Display and analyze bivariate data where one variable is categorical and the other is numerical. (10)

Missouri Grade Level Expectations: Communication Arts – Grades 9 – 12

Activity	Standard	GLE
2, 3	CA 2, 3 1.6	Apply decoding strategies to “problem-solve” unknown words when reading.
2, 3	CA 2, 3 1.5, 1.6	Develop vocabulary through text, using roots and affixes, context clues, glossary, dictionary and thesaurus.
2, 3	CA 2, 3 1.5 & 1.6	Apply pre-reading strategies to aid comprehension: access prior knowledge, preview, predict, set a purpose and rate for reading.
2, 3	CA 2,3 1.5 & 1.6	During reading, utilize strategies to self-question and correct, infer, visualize, predict and check using cueing systems: meaning, structure, and visual.
2, 3	CA 2, 3 1.6 & 3.5	Apply post-reading skills to comprehend and interpret text: question to clarify, reflect, analyze, draw conclusions, summarize, and paraphrase.

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2, 3	CA 2, 3, 7 1.5, 1.6, 1.9	Compare, contrast, analyze and evaluate connections between text ideas and own experiences.
2, 3	CA 3 1.6, 1.7, 2.4, 3.5, 3.6, 3.1, 3.4	Use details from text to analyze and evaluate the logic, reasonableness, and audience appeal of arguments in texts, identify and analyze faulty reasoning and unfounded inferences, and evaluate for accuracy and adequacy of evidence.
2, 3	CA 3 1.5, 1.6	Read and apply multi-step directions to perform complex procedures and/or tasks.
All activities	CA 1, 4 1.8, 2.1, 2.2	Follow a writing process to independently create appropriate graphic organizers as needed and apply writing process to write effectively in various forms and types of writing.
All activities	CA 1 1.6, 2.2	Use conventions of capitalization in written text.
All activities	CA 1 1.6, 2.2	Use parts of speech correctly in written text.
All activities	CA 1 1.6, 2.1, 2.2	In writing, use dictionary, spell-check and other resources to spell correctly.
All activities	CA 1 1.6, 2.1, 2.2	In composing text, use a variety of sentence structures, cohesive devices, and an active voice.
All activities	CA 2, 3, 4 1.6, 1.8, 4.8	Routinely use an appropriate method for note-taking.
2, 5	CA 2, 3, 4 1.8, 2.1, 4.1	Write multi-paragraph informative and persuasive essays, multi-paragraph texts that interpret, evaluate or persuade, use specific rhetorical devices, and use relevant evidence to defend a position.
3, 4	CA 2, 3, 4 1.2, 2.1, 3.5, 4.1	Write a multi-paragraph text that summarizes large amounts of information clearly and concisely.
All activities	CA 5, 6 1.5, 1.6, 1.10	Listen for enjoyment, for information, for directions, critically to summarize and evaluate communications that inform, persuade and entertain, to evaluate own and others' effectiveness in presentations and group discussions, using provided criteria, and to evaluate the validity and reliability of speaker's message.
All activities	CA 5, 6 1.5	Use active-listening behaviors (e.g., asks questions of speaker and uses body language and facial expressions to indicate agreement, disagreement or confusion).
All activities	CA 1, 6 2.1, 2.3, 4.6	In discussions and presentations, create concise presentations on a variety of topics, incorporate appropriate media or technology, respond to feedback, defend ideas, and demonstrate poise and self-control.
2, 3	CA 1, 6 2.1, 2.3	Give clear and concise multi-step oral directions to perform complex procedures and/or tasks.
2, 3	CA 2, 3 1.1, 1.4, 4.5	Develop an appropriate research plan to guide investigation and research of focus questions.
2	CA 5 1.5, 1.7, 2.7	Analyze, describe and evaluate the elements of messages projected in various media (e.g., videos, pictures, web-sites, artwork, plays and/or news programs).
Missouri Grade Level Expectations: Health Education – Grades 9 – 12 (2006 Draft Version)		
Activity	Standard	GLE

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2, 3, 4, 5	I 1.K.b	Describe the impact heredity has on system functions and disease formation.
2, 5	I 2.A.a	Cite evidence that supports the rights of both individuals and the communities when making societal health decisions.
4, 5	II 1.A.a	Demonstrate how short and long term behaviors affect the functioning of the human body systems.
4	II 1.A.b	Investigate the impact history and current practices have on the development of a healthy body.
3, 4, 5	II 1.B	Discuss the concept of preventive care and its importance in maintaining and improving health.
2, 4, 5	II 3.C	Develop a list of individuals and/or governmental agencies that have a major responsibility for providing assistance to people for their health.
2, 4, 5	II 4.B	Apply practices that preserve and enhance the safety and health of others (e.g., conflict resolution, peer mediation, seeking adult or professional consultation, stress management, goal setting, decision making, assertive behavior, resisting peer pressure, asset development).
4, 5	III 1.A.a	Describe the effects of positive lifestyle behaviors on the occurrence of disease.
2, 4	III 1.A.b	Conduct research to answer questions regarding epidemiological studies and cite evidence about the management and prevention of communicable and non-communicable diseases (e.g., local health department statistics, youth risk behavior survey [YRBS], Centers for Disease Control and Prevention [CDC], National Institutes of Health [NIH]).
4	III 1.A.c	Explain how risk behaviors can contribute to the development of chronic diseases (e.g., relationship between smoking and emphysema OR alcohol consumption and cirrhosis).
2, 4	III 1.J.a	Conduct research to answer questions regarding epidemiological studies and cite evidence about the management and prevention of communicable and non-communicable diseases (e.g., local health department statistics, youth risk behavior survey [YRBS], Centers for Disease Control and Prevention [CDC], National Institutes of Health [NIH]).
4	III 1.J.b	Explain how risk behaviors can contribute to the development of chronic diseases (e.g., relationship between smoking and emphysema OR alcohol consumption and cirrhosis).